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TECHNICAL REPORT

For The

Cargo Movement Operations System (CMOS)

Technical Assessment of No. 3011ECP\*005.01  
CMOS Increment I Interface Enhancement

30 January 1989

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SECTION I

INTRODUCTION: The purpose of this Technical Report is to provide the "Analysis of the CMOS Engineering Change Proposal".

SUMMARY: Not Used.

CONCLUSION: Not Used.

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## SECTION II

RESULTS: The "Analysis of the CMOS Engineering Change Proposal" is presented in the attached report.

Analysis of the CMOS Engineering Change Proposal

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SSC/AQFT

Date:

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## Section 1

*Introduction* This report is provided in response to the CMOS Engineering Change Proposal (ECP), Volume I. In order to reach a logical and timely decision, certain information that is missing from the ECP must be furnished. The purpose of this report is to identify that information. Section 1 contains an overview of our findings; Section 2, a list of required information; and Section 3, the details of our analysis of the ECP.

*Summary*. The CMOS ECP, Volume I, is evaluated in this report based on criteria related to the following issues of content: (1) the individual change impacts, (2) summarization of the change impacts, (3) risk assessment, (4) ECP incorporation plan, (5) information to aid prioritization, and (6) reasonableness checks. The ECP, in general, was found to be lacking in detail and logical flow between levels of analysis.

*Conclusion*. To permit a thorough examination of the ECP, the following information is needed:

- 1) For each baseline change, specific details on technical, cost, and schedule impacts.
- 2) For the summary of the baseline change impacts, logical relationships between identified subtasks, scheduling, and man-hour estimates.
- 3) For risk evaluation, more data on risk identification.
- 4) For aiding prioritization, quantitative data at the individual change level.
- 5) For reasonableness checks, additional material on your rationale and details regarding all estimates.

## Section 2

Information required in an ECP. This review is based on the purpose of an ECP, which is to document the analysis of the baseline change impacts and to provide information to facilitate the decision making process for the Government. The following elements and evaluation criteria are required, and considered critical to the overall value of an ECP:

1. The individual change impacts. Each baseline change should be analyzed separately and information compiled on its technical (i.e., hardware, software, documentation), cost, and schedule aspects.
2. Summarization of the change impacts. The analyses of the individual changes should be compiled into a summarization of the impact to the project. The logical flow from detail to summary should be obvious.
3. Risk assessment. Risks arising from the baseline changes should be identified and assessed.
4. ECP incorporation plan. A tentative plan for incorporating the ECP into the project should be outlined. It should include tentative scheduling charts and staff increases or decreases.
5. Information to aid prioritization. Specifics should pertain to the impact of changes on the efficiency of the design, costs related to each change and the development phase (short term view point), and costs related to each change and the project life cycle (long term view point). These are necessary to prioritize changes given the reality of limited resources.
6. Reasonableness checks. The estimates and information should pass a general reasonableness test. Estimated workloads and man-hours should compare reasonably to data collected on the project to date. Conversion of measurements into related terms should not make them appear to be out of proportion. For example, expressing man-hours in terms of x people working n days should still produce a reasonable number.

### Section 3

Analysis of the CMOS Engineering Change Proposal. This section presents an analysis of the CMOS ECP given the evaluation criteria outlined above.

1. The individual change impacts. Sufficient details about each change on technical, cost, and schedule impacts need to be evident. Technical tasks are identified for each change, but no cost or schedule impacts are provided.
2. Summarization of the change impacts. The main concerns in the summary center on the lack of an obvious link between the detailed information and the summary information. The following examples are cited:
  - a) The description provided in the body of the ECP is divided to reflect the subtasks for the proposed functional changes. The breakdown of required man-hours is divided into CLINs, which reflect the processes involved in producing deliverable items. Without the specific assignment of man-hours to subtasks or any description of how the summary of the man-hours was derived, it is difficult to assess the strengths or weaknesses of the proposed allocated resources.
  - b) Another deficiency lies in the seemingly redundant or overlapping nature of the CLIN breakout on page A1-1. As an example, the difference between CLIN 0120c, "Revise Software Requirement Specifications (SRSs)", (660 hours), and CLIN 0130a, "Prepare Revised Final SRS for Delivery", (1,360 hours), is not evident, nor does the description in the body of the text clarify matters. If, for example, the second iteration of each document were deleted, over 2900 man-hours could be deducted from the total man-hour figure. This area needs further study to ensure its necessity and accuracy.
  - c) There is little, if any, link between the technical solution tasks and the tasks (CLINs) used to estimate man-hours. Similarly, there is no link between the technical solution tasks and the changes to schedule. A valid relationship among technical solution tasks, man-hour estimates, and schedule changes is not obvious.
3. Risk assessment. Risk identification and assessment is not directly addressed, with the exception of the limiting nature of the changed LOGMARS memory requirement.
4. ECP incorporation plan. This information is indirectly provided through scheduling charts.

5. Information to aid prioritization. Since no quantitative data is presented at the individual change level, prioritization can only be based on perceived functional benefits. This does not allow cost versus benefit analysis to aid in the allocation of resources to the changes.

6. Reasonableness checks. The estimates in this report do not compare reasonably with data collected on the project to date. For example, this ECP is estimated to require 45 per cent of the man-hours already expended on the project. Given the volume of work accomplished to date, this does not seem reasonable. Additionally, using the number of days assigned a task from the pert chart and its associated man-hour estimate to calculate the number of people required to work the tasks, makes some tasks appear to be overladen with personnel. Logical links between levels of analysis would probably clear up some of this confusion.